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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/659,412	09/10/2003	Markku J. Heikkila	872.0153.U1(US)	4649
29683	7590	05/29/2007		
HARRINGTON & SMITH, PC 4 RESEARCH DRIVE SHELTON, CT 06484-6212			EXAMINER PATHAK, SUDHANSHU C	
			ART UNIT	PAPER NUMBER
			2611	
			MAIL DATE	DELIVERY MODE
			05/29/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/659,412

Applicant(s)

HEIKKILA, MARKKU J.

Examiner

Sudhanshu C. Pathak

Art Unit

2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Sept. 10th, 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 1-22 are pending in the application.

Drawings

2. Figure 1 should be designated by a legend such as "Prior Art" since that which is known is illustrated. Correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

4. Claims 1-3 (method) & 9-10, 12-13 (receiver) & 15 (detector) are rejected under 35 U.S.C. 102(a) as being anticipated by Applicant Admitted Prior Art (AAPA).

In regards to Claims 1, 9, 12 & 15, the AAPA discloses a method to obtain M final symbol decisions for signals received through N receive antennas that were transmitted in M parallel data layers, using a same spreading code from M transmit antennas (Fig. 1 & Specification, Page 1, Background, Paragraph 2 & Specification, Page 2, lines 5-11 & Specification, Page 3, lines 3-4 & Specification, Page 5, lines 1-5) {Interpretation: The reference discloses a MIMO system wherein the wherein the receiver receives signals that are transmitted by different users, but also signals for the same user (same spreading codes) with multipath}, comprising: space-time equalizing the N received signals to generate M output signals from which at least inter-symbol interference is substantially removed and inter-layer interference is

suppressed (Specification, Page 2, lines 4-7); despreading each of the M output signals for generating M soft symbol estimates (Specification, Page 2, lines 12-14 & Specification, Page 5, lines 2-11); and processing the M soft symbol estimates to derive M final symbol decisions that are made in consideration of modeled residual inter-layer interference present in the space-time equalized M output signals (Specification, Page 2, Eq. 1 & Specification, Page 3, Eq. 3 & Specification, Page 4, Eq. 4) {Interpretation: The reference discloses complex weighting factor applied to the signal sample from the received antennas wherein the received vector is modeled using the estimated channel matrix and the weighting is modeling the residual interference since the matrix includes not only the diagonal components but non-diagonal components with id the interference components}.

In regards to Claim 2, the AAPA discloses a method to obtain M final symbol decisions for signals received through N receive antennas as described above. The AAPA further discloses where processing includes operating a signal-plus-residual-interference (SPRI) detector that operates in accordance with a maximum likelihood (ML) technique (Specification, Page 2, lines 4-14).

In regards to Claims 3, 13, the AAPA discloses a method to obtain M final symbol decisions for signals received through N receive antennas as described above. The AAPA further discloses the space-time equalizing employs a linear minimum mean-square error (LMMSE) criterion (Specification, Page 4, lines 10-15).

In regards to Claim 10, the AAPA discloses a method to obtain M final symbol decisions for signals received through N receive antennas as described above. The

AAPA further discloses the equation as disclosed in the instant claim (Specification, Page 2, Eq. 1 & Specification, Page 3, Eq. 3).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 4, 14, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant Admitted Prior Art (AAPA).

In regards to Claims 4 & 14, the AAPA discloses a method to obtain M final symbol decisions for signals received through N receive antennas as described above. The AAPA further discloses transmitting occurs at a base station having the M transmit antennas, where receiving occurs at a mobile station having the N receive antennas (Specification, Page 5, lines 1-3) {Interpretation: The reference discloses a downlink signal wherein downlink in a wireless system implies a transmission by the base station and the reception by the mobile station}. However, the AAPA does not explicitly disclose $N < M$. It would have been obvious to one of ordinary skill in the art at the time of the invention that there is no criticality in selecting more transmit antennas than the receive antennas, this is a matter of design choice depending on the processing power of the mobile station and the reliability of the data received.

7. Claims 5-8 (system) & 18-20 (system) are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant Admitted Prior Art (AAPA) in view of Margulis et al. (7,010,016).

In regards to Claim 5, 18-19, the AAPA discloses a system to obtain M final symbol decisions for signals received through N receive antennas that were transmitted in M parallel data layers, using a same spreading code from M transmit antennas (Fig. 1 & Specification, Page 1, Background, Paragraph 2 & Specification, Page 2, lines 5-11 & Specification, Page 3, lines 3-4 & Specification, Page 5, lines 1-5) {Interpretation: The reference discloses a MIMO system wherein the wherein the receiver receives signals that are transmitted by different users, but also signals for the same user (same spreading codes) with multipath}, comprising: a space-time equalizer for operating on the N received signals to generate M output signals from which at least inter-symbol interference is substantially removed and inter-layer interference is suppressed (Specification, Page 2, lines 4-7); a despreader for despreading each of the M output signals for generating M soft symbol estimates (Specification, Page 2, lines 12-14 & Specification, Page 5, lines 2-11); and means for processing the M soft symbol estimates to derive M final symbol decisions that are made in consideration of modeled residual inter-layer interference present in the M output signals of said space-time equalizer (Specification, Page 2, Eq. 1 & Specification, Page 3, Eq. 3 & Specification, Page 4, Eq. 4) {Interpretation: The reference discloses complex weighting factor applied to the signal sample from the received antennas wherein the received vector is modeled using the estimated

channel matrix and the weighting is modeling the residual interference since the matrix includes not only the diagonal components but non-diagonal components with id the interference components}. However, the AAPA does not disclose a plurality of despreaders for despreding the received signals.

Margulis discloses a WCDMA receiver to despread spread-spectrum channels wherein the receiver comprising a rake receiver further comprising multiple fingers to despread the multipath signals (Claim 24). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Margulis discloses a plurality of despreaders for despreding the received signals and this is implemented in the receiver as described in AAPA so as to be able to implement the rake algorithm so as to mitigate the effects of multipath and increase the reliability of the receiver.

In regards to Claims 6 & 20, the AAPA in view of Margulis discloses a method to obtain M final symbol decisions for signals received through N receive antennas as described above. The AAPA further discloses where processing includes operating a signal-plus-residual-interference (SPRI) detector that operates in accordance with a maximum likelihood (ML) technique (Specification, Page 2, lines 4-14). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that AAPA in view of Margulis satisfies the limitations of the claim.

In regards to Claim 7, the AAPA in view of Margulis discloses a method to obtain M final symbol decisions for signals received through N receive antennas as described above. The AAPA further discloses the space-time equalizing employs a

linear minimum mean-square error (LMMSE) criterion (Specification, Page 4, lines 10-15). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that AAPA in view of Margulis satisfies the limitations of the claim.

In regards to Claim 8, the AAPA in view of Margulis discloses a method to obtain M final symbol decisions for signals received through N receive antennas as described above. The AAPA further discloses transmitting occurs at a base station having the M transmit antennas, where receiving occurs at a mobile station having the N receive antennas (Specification, Page 5, lines 1-3) {Interpretation: The reference discloses a downlink signal wherein downlink in a wireless system implies a transmission by the base station and the reception by the mobile station}.

However, the AAPA does not explicitly disclose $N < M$. It would have been obvious to one of ordinary skill in the art at the time of the invention that there is no criticality in selecting more transmit antennas than the receive antennas, this is a matter of design choice depending on the processing power of the mobile station and the reliability of the data received. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that AAPA in view of Margulis satisfies the limitations of the claim.

In regards to Claim 22, the AAPA in view of Margulis discloses a method to obtain M final symbol decisions for signals received through N receive antennas as described above. The AAPA further discloses system forms a part of an ordered successive interference canceller (OSIC) receiver (Specification, Page 2, lines 7-8).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that AAPA in view of Margulis satisfies the limitations of the claim.

8. Claims 11 (receiver) & 16 (detector) is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant Admitted Prior Art (AAPA) in view of Onggosanusi et al. (2006/0291581).

In regards to Claims 11 & 16, the AAPA discloses a method to obtain M final symbol decisions for signals received through N receive antennas as described above. However, AAPA does not disclose the equation as disclosed in the instant claim.

Onggosanusi discloses the equation for the maximum likelihood equation so as to be able to optimally determine the received symbols (Paragraph 29 & Eq. (in the paragraph)). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Onggosanusi teaches the equation as disclosed in the instant claim and this is implemented in the receiver as described in AAPA so as to be able to implement the ML detector.

9. Claim 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant Admitted Prior Art (AAPA) in view of Margulis et al. (7,010,016) in further view of McElwain (7,218,665).

In regards to Claim 21, the AAPA in view of Margulis discloses a method to obtain M final symbol decisions for signals received through N receive antennas as described above. However, AAPA in view of Margulis does not disclose the detector operates in accordance with a MAP technique.

McElwain discloses a multi-user and a single user detector implementing a MAP detector (Column 12, lines 55-65). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that McElwain teaches a detector operates in accordance with a MAP technique and this is implemented in the system as described in AAPA in view of Margulis so as to increase the reliability of the received data.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure, it is recommended to the applicant to amend all the claims so as to be patentable over the cited prior art of record. A detailed list of pertinent references is included with this Office Action (See Attached "Notice of References Cited" (PTO-892)).

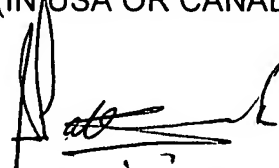
11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sudhanshu C. Pathak whose telephone number is (571)-272-3038. The examiner can normally be reached on M-F: 9am-6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh M. Fan can be reached on (571)-272-3042.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2611

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Sudhanshu C. Pathak
Examiner
Art Unit 2611